Shanmuga Industries Arts & Science College T.V.Malai

APRIL/MAY 2025

23UECA12B/23UEDA12B/23UECS12A/
23UESC12A — NUMERICAL METHODS — I

Time : Three hours Maximum : 75 marks

SECTION A — ($10 \times 2 = 20$ marks)

Answer ALL questions.

1. Write the law to reduce $y = ax^n$ as linear.
2. Write the equation of the straight line passing through the points (1, 1) and (2, 2).
3. What is the order of convergence of iterative process?
4. Give order of convergence of Newton Raphson Method.
5. Given $2x + y = 3$, $7x - 3y = 4$, using Gauss elimination method find the value of x and y.
6. What is the condition of convergence for the solution to a system of linear equations will exists for the iterative procedure?
7. Give the Newton's forward difference interpolation formula.
8. Name the following operators $\Delta, \nabla, \in$ and relate it.

SECTION C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. From the table given below, find the best value of a and b in the law $y = ae^{bx}$ by the method of least squares.

X	0	5	8	12	20
Y	3.0	1.5	1.0	0.55	0.18

17. Find the positive root of $3x - \cos x - 1 = 0$ using Newton Raphson method correct to six decimal places.
18. Solve the system of equations by Gauss Jacobi method.
$8x - 3y + 2z = 20$, $4x + 11y - z = 33$,
$6x + 3y + 12z = 35$
19. The population of the town is as follows :

Year	1941	1951	1961	1971	1981	1991
Population	20	24	29	36	46	51

Estimate the population increase during the period $x = 1976$.

20. Using Stirling formula find $Y(1.22)$ from the following table :

X	1	1.1	1.2	1.3	1.4
Y	0.84147	0.89121	0.93204	0.96356	0.98545
X	1.5	1.6	1.7	1.8	
Y	0.99749	0.99957	0.99385	0.97385	

9. Write the Gauss's backward interpolation formula.

10. Write the Stirling formula.

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SECTION B — (5 × 5 = 25 marks)

Answer ALL questions.

11. (a) Find a straight line fit of the form $y = a + bx$ by the method of group averages for the following data :

X	0	5	10	15	20	25
Y	12	15	17	22	24	30

Or

(b) Fit a curve of the form $y = ax^b + c$ to the following data.

X	2	4	6	8	10
Y	5.0	8.6	13.9	25.3	35.6

12. (a) Find the positive root of $x^3 - x = 1$ correct to four decimal places by bisection method.

Or

(b) Find the positive root of $x^3 - 4x + 1 = 0$ correct to four decimal places by Regula Falsi method.

13. (a) Solve the system of equations by Gauss Elimination Method.
$2x + 3y - z = 5, 4x + 4y - 3z = 3,$
$2x - 3y + 2z = 2.$

Or

(b) Solve the system of equations by Gauss Jordan Method.
$x + y + z + w = 2,\ 2x - y + 2z - w = -5,$
$3x + 2y + 3z + 4w = 7,\ x - 2y - 3z + 2w = 5.$

14. (a) From the following table, find the missing value.

X	2	3	4	5	6
$f(x)$	45.0	49.2	54.1	—	67.4

Or

(b) Using Newton's forward interpolation formula find the value of y if $x = 21$ from the following data :

X	20	23	26	29
Y	0.3420	0.3907	0.4384	0.4848

15. (a) Using Gauss's backward interpolation formula find the value of the population for the year 1936 given that,

Year	1901	1911	1921	1931	1941	1951
Population	12	15	20	27	39	52

Or

(b) Using Gauss's forward interpolation formula find the value of $f(x)$ at $X = 32$, given that

X	25	30	35	40
$F(X)$	0.2707	0.3027	0.3386	0.3794